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10/043,474	01/10/2002	Leonid Baraz	42390.P8254	6444
8791 7590 01/05/2007 BLAKELY SOKOLOFF TAYLOR & ZAFMAN 12400 WILSHIRE BOULEVARD SEVENTH FLOOR LOS ANGELES, CA 90025-1030			EXAMINER CHOW, CHIH CHING	
			ART UNIT 2191	PAPER NUMBER
SHORTENED STATUTORY PERIOD OF RESPONSE		MAIL DATE	DELIVERY MODE	
3 MONTHS		01/05/2007	PAPER	

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

## Office Action Summary

Application No.

10/043,474

Applicant(s)

BARAZ ET AL.

Examiner

Chih-Ching Chow

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 18 September 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-8, 10-17 and 19-26 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-8, 10-17 and 19-26 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 08 April 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date 5/9/02.
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- ☐ Notice of Informal Patent Application
- ☐ Other: \_\_\_\_\_.

### **DETAILED ACTION**

1. This action is responsive to amendment dated September 18, 2006.
2. Per Applicants' request, claims 1, 2, 4, 5, 6, 7, 8, 10, 11, 13, 14, 15, 16, 17, 19, 20, 22, 23, 24, 25, and 26 have been amended.
3. Claims 1-8, 10-17, 19-26 remain pending.
4. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 09/02/2005 has been entered.

### **Response to Amendment**

5. Applicants' amendment for Claims 1, 2, 4, 5, 6, 7, 8, 10, 11, 13, 14, 15, 16, 17, 19, 20, 22, 23, 24, 25, and 26 have been fully considered respectfully by the examiner but they are not persuasive. Basically, adding the 'first' program in claims do not change the merit of the subject matter, the prior arts also apply to a program, which has the same meaning as the 'first' program; therefore, the Examiner is maintaining the 35 USC § 103 Rejections. For the Applicants' convenience they are listed as following, with the amendments requested by the Applicants.

### **Claim Rejections - 35 USC § 112**

6. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

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7. Claims 1,<sup>2</sup> 10,<sup>17</sup> and 19<sup>26</sup> are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claims 1, 10, and 19 recite: 'the one or more additional registers of an expanded register set for use when executing the first program are used by a second program to store data used to analyze the execution of the first program' – it's not described in the Specification, what does 'used by a second program' mean, is that mean all the additional registers will remain (they will not to be deallocated) after the first program is executed for other program to use, both the first and the second programs are independent from each other? Or there is a relationship between the first and the second program, if so how are they related? It's not clear how does the second program use the stored data to analyze the execution of the first program?

### Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claims 1, 2, 4-8, 10-11, 13-17, 19-20, 22-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over US2003/0079210, by Peter Markstein et al. (hereinafter "Markstein"), in view of U.S. Patent No. 5,875,318 by Langford (hereinafter "Langford").

### CLAIM

1. A machine-implemented method comprising:  
analyzing one or more instructions of a first program; and  
modifying the first program to expand a register set for a routine in the first program transparently to execution of the first program that includes adding one or more additional registers to the register set, wherein the one or more additional registers of an expanded register set for use when executing the first program are used by a second program to store data used to analyze the execution of the first program.

### Markstein / Langford

Markstein teaches the feature of analyzing a program, in Markstein, paragraph 48, "the entire source code is analyzed to generate a control flow graph" (*analyzing instructions of the first program*); Markstein also teaches 'expand a register set', in paragraph 6, last two sentences, "A prologue and epilog typically includes code executed before and after a subroutine or program. For example, when a prologue is executed stack space may be allocated for saving necessary context, such as saving callee-saved registers. When an epilog is executed (*the second program*), the compiler may restore any necessary registers."; in paragraph 51, "Additional register allocation may be needed if a single intermediate level instruction expands into more than one target level instruction". – all the register manipulation is considered done by the second program, therefore the prior art still reads on the current application. For the register is used store data used to analyze the execution of the program feature, see Markstein's paragraph 0040, "For each intermediate-language operation, each operand is analyzed to determine whether it is already stored in a real register. If the operand is stored in a real register, then the register is marked as used-in-current-operation, as well as busy. If the operand is not stored in a real register, a real register is allocated from registers that are not marked as used-in-current-operation. (*storing data for transparently to execution analysis*).". Markstein teaches all aspects of claim 1, but he does not mention 'modifying program' and 'storing data used to analyze the execution of the program'

specifically, however, Langford teaches it in an analogous prior art. See Langford's column 1, lines 44-45, "A '**self-modifying code**' is a technique used by programmers to increase the processing speed of executable programs." Also see Langford's FIG. 2, and column 3, lines 4-15, "This **modification** may be in the form of incrementing or using a different register to store a particular data each time the **code is executed**. For example, the basic instruction of instruction (m) may be to copy the contents of a register into memory using another register and an offset to form the address of the memory store such as: copy C.sub.x D.sub.s i, where C.sub.x is the register from which the data will be copied, D.sub.s is the register containing the base address of the data and (i) is an offset to D.sub.s. Instruction 12 may be incrementing the offset (i). Therefore each time the code is executed, the content of register C.sub.x is copied into a different memory location (*modifying program and using register to store data for program execution analysis*)."

It would have been obvious to a person of ordinary skill in the art at the time of the invention was made to supplement Markstein's disclosure of the analyzing program and expanding registers by modifying program and using register to store program data taught by Langford, for the purpose of minimizing performance degradation (see Langfor's title).

2. The method of claim 1, comprising:  
identifying one or more register moves for the expanded register set; and  
modifying the program to perform the first identified one or more register moves.

For the feature of claim 1 see claim 1 rejection. In Markstein paragraph 9, "identifying an operand from the intermediate code to store in a real **register**; and selecting an appropriate class

4. The method of claim 1, wherein the modifying the first program comprises modifying the first program to expand a register set for a callee routine of the first program.

5. The method of claim 4, comprising: modifying the first program to expand a register set for a caller routine that is to call the callee routine.

6. The method of claim 5, wherein the modifying the first program to expand a register set for the callee routine comprises modifying the first program to expand a register set that includes one or more registers of the register set for the caller routine.

of real registers to store the operand.” See claim rejection 1 has for ‘modifying program’ feature.

For the feature of claim 1 see claim 1 rejection. Again, in Markstein paragraph 51, “**Additional register allocation may be needed** if a single intermediate level instruction expands into more than one target level instruction”, the additional register (*expand register set*) can be for a callee routine or a caller routine. See Markstein, paragraph 27, “Different classes of real registers may include **caller-saved registers and callee-saved registers**. **Callee-saved registers** are preferably used to store local variables and stack items”, also in the same paragraph, “A program (*the first program*) may be compiled such that a library routine may store a temporary computation in a **caller-saved register**. Local variables and stack items, which are generally needed for a longer period of time, are stored in **callee-saved registers** (*for a callee routine of the program*)”.

For the feature of claim 4 see claim 4 rejection. In Markstein’s disclosure cited in claim 4 rejection, it covers both callee routine and caller routine, and the caller routine can call the callee routine.

For the feature of claim 5 see claim 5 rejection. For the rest of the claim 6 feature see claim 4 rejection.

7. The method of claim 5, comprising:

- (a) identifying one or more register moves for the register set of the caller routine; and
- (b) modifying the first program to perform the identified one or more register moves prior to or upon returning from the callee routine to the caller routine.

For the feature of claim 5 see claim 5 rejection. For the rest of the claim 7 feature see claim 1 rejection.

8. The method of claim 5, comprising:

- (a) identifying a register move from a register added to the register set for the caller routine to a register added to the register set for the callee routine; and
- (b) modifying the first program to perform the identified register move.

For the feature of claim 5 see claim 5 rejection. For the rest of the claim 8 feature see claim 1 rejection.

10. A machine-readable medium having instructions that, if executed by a machine, cause the machine to perform a method comprising:

- analyzing one or more instructions of a first program; and
- modifying the first program to expand a register set for a routine in the first program transparently to execution of the first program that includes adding one or more ~~additional~~ registers to the register set, wherein the one or more ~~additional~~ registers of an expanded register set for use when executing the first program are used by a second program to store data used to analyze the execution of the first program.

Markstein's FIG. 4 shows a 'machine-readable' medium as cited in claim 10. For the rest of the features see claim 1 rejection.

11. The machine-readable medium of claim 10, wherein the method comprises:

- identifying one or more register moves for the expanded register set; and
- modifying the first program to perform the identified one or more register moves.

For the feature of claim 10 see claim 10 rejection. For the rest of the features see claim 2 rejection.

13. The machine-readable medium of claim

For the feature of claim 10 see claim 10



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- 10, wherein the modifying the first program comprises modifying the first program to expand a register set for a callee routine of the first program. rejection. For the rest of the features see claim 4 rejection.
14. The machine-readable medium of claim 13, wherein the method comprises: modifying the first program to expand a register set for a caller routine that is to call the callee routine. For the feature of claim 13 see claim 13 rejection. For the rest of the features see claim 5 rejection.
15. The machine-readable medium of claim 14, wherein the modifying the first program to expand a register set for the callee routine comprises modifying the first program to expand a register set that includes one or more registers of the register set for the caller routine. For the feature of claim 14 see claim 14 rejection. For the rest of the features see claim 6 rejection.
16. The machine-readable medium of claim 14, wherein the method comprises:  
(a) identifying one or more register moves for the register set of the caller routine; and  
(b) modifying the first program to perform the identified one or more register moves prior to or upon returning from the callee routine to the caller routine. For the feature of claim 14 see claim 14 rejection. For the rest of the claim 16 feature see claim 7 rejection.
17. The machine-readable medium of claim 14, wherein the method comprises:  
(a) identifying a register move from a register added to the register set for the caller routine to a register added to the register set for the callee routine; and  
(b) modifying the first program to perform the identified register move. For the feature of claim 14 see claim 14 rejection. For the rest of the claim 17 features see claim 8 rejection.
19. A system comprising:  
a processor to execute instructions; and  
a medium having instructions to analyze one or more instructions of a first program Same as claim 1 rejection.

and to modify the first program to expand a register set for a routine in the first program transparently to execution of the program that includes adding one or more ~~additional~~ registers to the register set, wherein the one or more ~~additional~~ registers of an expanded register set for use when executing the first program are used by a second program to store data used to analyze the execution of the one or more instructions of the first program.

20. The system of claim 19, the medium having instructions to identify one or more register moves for the expanded register set and to modify the first program to perform the identified one or more register moves.

For the feature of claim 19 see claim 19 rejection. For the rest of the features see claim 2 rejection.

22. The system of claim 19, the medium having instructions to modify the first program to expand a register set for a callee routine of the first program.

For the feature of claim 19 see claim 19 rejection. For the rest of the features see claim 4 rejection.

23. The system of claim 22, the medium having instructions to modify the first program to expand a register set for a caller routine that is to call the callee routine.

For the feature of claim 22 see claim 22 rejection. For the rest of the features see claim 5 rejection.

24. The system of claim 23, the medium having instructions to modify the first program to expand a register set that includes one or more registers of the register set for the caller routine.

For the feature of claim 23 see claim 23 rejection. For the rest of the features see claim 6 rejection.

25. The system of claim 23, the medium having instructions to identify one or more register moves for the register set of the caller routine and to modify the first program to perform the identified one or more register moves prior to or upon returning from the callee routine to the

For the feature of claim 23 see claim 23 rejection. For the rest of the features see claim 7 rejection.

caller routine.

26. The system of claim 23, the medium having instructions to identify a register move from a register added to the register set for the caller routine to a register added to the register set for the callee routine and to modify the first program to perform the identified register move.

For the feature of claim 23 see claim 23 rejection. For the rest of the features see claim 8 rejection.

10. Claims 3, 12 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over US2003/0079210, by Peter Markstein et al. (hereinafter "Markstein"), in view of in view of U.S. Patent No. 5,875,318 by Langford (hereinafter "Langford"), and further in view of U.S. Patent No. 5, 644,709 by Todd Michael Austin (hereinafter "Austin").

#### **CLAIM**

3. The method of claim 2, wherein the identifying comprises:

- (a) defining one or more move chains for the expanded register set, and
- (b) identifying a sequence of one or more register moves based on the defined one or more move chains.

#### **Markstein / Langford /Austin**

For the feature of claim 2 see claim 2 rejection. For item (b), see Langford's column 3, lines 1-3, "FIG. 2 illustrates a block of source code and its resulting translation. Source code 10 is made of a **sequence of instructions** which comprise instruction 12 and instruction (m). Instruction 12 modifies instruction (m). This modification may be in the form of incrementing or using a different **register** to store a particular data each time the code is executed." Markstein and Langford teach all aspects of claim 3, but they do not mention 'move chain' specifically, however, Austin teaches it in an analogous prior art. In Austin column 7, lines 19-26, "A **call-chain** is the state of the stack at some point in a program's execution; it is composed of a **sequence of function names**; functions higher in the **call-chain** call (possibly indirectly) the functions lower in the **call chain**; neighbors in the **call-chain** share a direct caller-callee

**relationship.** A partial call-chain is a subset of the current complete call-chain, usually taken from the bottom of the complete call chain; partial call-chains are usually employed to reduce storage requirements.”

It would have been obvious to a person of ordinary skill in the art at the time of the invention was made to supplement Markstein’s and Langford’s disclosures of the analyzing program and expanding registers by call chain taught by Austin, for the purpose of adjusting the appropriate counts at calls (Austin column 7, lines 34-35) thus no callee routine would be left out during a program rearrangement.

12. The machine-readable medium of claim 11, wherein the identifying comprises:

(a) defining one or more move chains for the expanded register set, and

(b) identifying a sequence of one or more register moves based on the defined one or more move chains.

For the feature of claim 11 see claim 11 rejection. For the rest of the features see claim 3 rejection.

21. The system of claim 20, the medium having instructions to define one or more move chains for the expanded register set and to identify a sequence of one or more register moves based on the defined one or more move chains.

For the feature of claim 20 see claim 20 rejection. For the rest of the features see claim 3 rejection.

### **Conclusion**

The following summarizes the status of the claims:

35 USC § 112 (1) rejection: Claims 1, 10, 19

35 USC § 103 rejection: Claims 1-8, 10-17, 19-26

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chih-Ching Chow whose telephone number is 571-272-3693. The examiner can normally be reached on 7:30am - 4:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wei Zhen can be reached on 571-272-3708. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300. Any inquiry of a general nature of relating to the status of this application should be directed to the **TC2100 Group receptionist: 571-272-2100**.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Chih-Ching Chow  
Examiner  
Art Unit 2191  
December 12, 2006

CC

  
WEI ZHEN  
SUPERVISORY PATENT EXAMINER